



A.D. 1857 N^c 2023.

S P E C I F I C A T I O N

OF

JEAN JACQUES BOUVERT
AND
FRANCOIS ISIDORE JEAN PASCAL.

SMOKE-PREVENTING APPARATUS.

L O N D O N :

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A.D. 1857 N° 2023.

Smoke-preventing Apparatus.

LETTERS PATENT to Jean Jacques Bouvert, Civil Engineer, and François Isidore Jean Pascal, Solicitor, both of Paris, in the Empire of France, for the Invention of “**IMPROVEMENTS IN SMOKE-PREVENTING APPARATUS.**”

Sealed the 23rd September 1857, and dated the 23rd July 1857.

COMPLETE SPECIFICATION filed by the said Jean Jacques Bouvert and François Isidore Jean Pascal at the Office of the Commissioners of Patents, with their Petition and Declaration, on the 23rd July 1857, pursuant to the 9th Section of the Patent Law Amendment Act, 1852.

5 **TO ALL TO WHOM THESE PRESENTS SHALL COME**, we, JEAN JACQUES BOUVERT, Civil Engineer, and FRANÇOIS ISIDORE JEAN PASCAL, Solicitor, both of Paris, in the Empire of France, send greeting.

10 **WHEREAS** we are in possession of an Invention for “**IMPROVEMENTS IN SMOKE-PREVENTING APPARATUS,**” and have petitioned Her Majesty to grant unto us, our executors, administrators, and assigns, Her Royal Letters Patent for the same, and have made solemn declaration that we are the first and true Inventors thereof.

15 **NOW KNOW YE**, that we, the said Jean Jacques Bouvert and François Isidore Jean Pascal, do hereby declare that the following Complete Specification, under our hand and seal, fully describes and ascertains the nature of the said Invention, and the manner in which the same is to be performed

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reference being had to the Sheet of Drawings hereunto annexed, and to the letters and figures marked thereon (that is to say):—

The improvements in smoke-preventing or consuming made by us are intended to obviate the production of smoke in steam-engine and other furnaces. Smoke, as generally well known, is so much gaseous matter which 5 has escaped combustion in the furnaces producing it.

The principle of the Invention consists, first, in presenting the combustible material to the action of the furnace, by submitting it to a complete torrefaction, in order to liberate the incombustible gases, and to use immediately the combustible gas for the benefit of the furnace which has produced them, 10 by collecting and conducting them directly into the incandescent part of the fire.

All the parts of the apparatus which constitute the whole of the system are marked in the Drawings with alphabetical letters and figures of reference, which Drawings indicate their respective shapes, and, with the following 15 description, the nature of the materials of which they should be composed.

It is evident that the parts which have to undergo the action of heat at a very high degree of temperature should be of fireproof ceramic composition, capable of resisting a great degree of heat without warping or breaking, in short, it should be able to sustain the heat to which it is subject without 20 deteriorating in the slightest degree.

Figure 1 represents the plan of the grate and of the hearth (or floor), and also of the abutment at the back, where twelve elliptical cast-iron tubes are shown. These are coated with fireproof matter, and have the property of collecting the smoke by means of the void or partial vacuum produced by the 25 first ignition established in these tubes. This smoke is burnt as soon as it enters these tubes, by admitting the surrounding air introduced by the conduct pipes, marked in the longitudinal section, Figure 6, by the Numbers 1, 2, and 3.

Figure 2 represents the plan at the height of the boiler tubes and the 30 basement of the side retorts.

Figure 3, plan at the height of the boiler, showing the position of the retorts at that point.

Figure 4 represents a front elevation of the whole, which is partly in vertical section. *b, b*, door, in the shape of a stopper, for introducing the 35 coal; *c, c*, section of a retort, showing its form and arrangement; and *d, d*, outlet for the torrefied coal; *e*, opening, shut by a door on hinges, intended for the purpose of freeing the coal in case it should adhere or set fast in *c, c*; this is precautionary, for the introduction of instruments to insure the descent

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of the coal to the grate; *f, f*, cast-iron plate, with holes for introducing the bars *d, d*, in order to begin the fire; *a*, ash-pit, which serves to incinerate the coal cinder completely; this coal cinder is reduced to ashes, and afterwards withdrawn through the side opening *b¹, b¹*.

5 Figure 5, column-shaped chimney, showing in part the exterior, partly in vertical section, which exhibits also inclined plates or sections, intended to prevent the rapidity of the upward passage of the colorific currents.

Figure 0 0, crown or top piece of the chimney, covered with a disc, having perforations arranged spirally, which turns on a pivot, so as to allow the
10 current of hot air to escape, which is generated according to the greater or less energy of combustion in the furnace.

Figure 6 represents a longitudinal section, which shows the arrangement of the retorts *c, c*; *b, b*, openings for loading or charging the coal into the retorts, which descends by its own weight on to the grate of the furnace; *c*, empty
15 space for the gases generated, which by their own pressure are caused to return and descend to the hottest parts of the furnace; *d, d*, three round iron bars, which serve to support the coal in the retort while making the fire on the grate when the combustion has sufficiently ignited the fuel in the furnace, and, when the steam guage has indicated the desired pressure, the bars *d, d*,
20 are withdrawn, in order to leave the torrifed coal in the retort free to descend of itself on to the grate of the furnace. Note.—These bars are only required from 35 to 40 minutes, that is to say, till incandescence is thoroughly established in the fireplace.

a, sides of the ash-pit, at an incline of about forty-five degrees, more or less,
25 according to the width of the furnace, which are pierced with rings covered with small hoods, which are explained with reference to Figure 4; *m, m*, tubes, in side view, showing the holes and their utility, as explained with reference to Figure 1; *n, n*, coarse iron cage or basket, containing calcined limestone, which is intended to absorb the incombustible gases, and the carbonic acid in
30 particular. Introduction of the limestone is indispensable when it is wished to utilise the currents of heated air to warm workshops or other places, for which purpose it is necessary to renew the limestone at least twice a week, to prevent the air necessary for respiration becoming vitiated; 1, 2, and 3, inlets of air into the tubes *m, m*, represented in the plan at Figure 1.

35 Figure 7 represents the section of a retort and the structure of the parts which compose it; it is represented on an enlarged scale to show its arrangement more correctly.

By the vertical curve of the retort, which is indispensable, in order to the

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approach towards the centre of the furnace (an essential condition for obtaining prompt torrefaction), the escape of combustible gases and great rapidity of combustion is obtained. This also assists the reflection of the calorific rays on to the boiler, which results in the rapid production of steam. 5

Figure 7: *d, d*, two descending conduct pipes, which are dotted in this Figure, and indicated in the plans at Figures 2 and 3, marked Q and R, which are collectors of the gases comparatively incombustible in the state of smoke, which gases are consumed on reaching the tube *g, g*, Figure 10. P, P, retort heads, which, being far from the fire, are made of cast iron; 10 *h, h*, represents parts of the apparatus made of refractory or fireproof litho-ceramic composition, which is one of the principal features; it ensures resistance to the heat of the furnace for a great length of time. These parts are shown separately at Figure 8, which represents the side of the furnace. It will be understood that the ribs, which maintain the same level of the 15 surface, serve equally to multiply the reflecting surfaces of the caloric, and to transmit it (the caloric) rapidly for the torrefaction of the fuel in the retort, in order to act in concert with the fire of the furnace. These parts are made of a new composition, as neither iron, copper, nor any other metal (platina excepted) will sufficiently resist the action of a continual fire. Figure 9 20 represents one of the cheeks of the lower part of a retort made entirely of refractory litho-ceramic material.

Figure 10: *g, g*, elliptical tubes, which run along the sides of the furnace, and are established so as to receive the smoke from the collectors Q and R (Figures 2 and 3). This smoke is distributed through holes, in order to be 25 injected on the most incandescent part of the fire; hence great economy of fuel is effected by the increase of the temperature which results from the flames produced by the smoke so consumed.

Figure 11 represents the three necessary working tools for stoking or directing the fire; J, hollowed shovel for loading the retorts; K, tool, called 30 the "coke-breaker;" it serves to break up the coal which is partially coked and adhering together in the retorts; L, fire-iron, serving to poke or otherwise stoke the fire to regulate the combustion.

By the arrangement of means and apparatus herein-before described large chimneys may be altogether dispensed with, and in future it will suffice to 35 establish a pipe of sufficient diameter as a chimney, extending about a foot or two above the roofing of buildings in which the said apparatus is placed, so that the hot air may escape to the atmosphere.

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CHEMICAL PART.

Manufacture of the Parts of the Apparatus which serves to render this System of Smoke Consuming complete.

In order to obtain a good refractory composition adapted for the requirements of the smoke consumer,—

First, selection must be made of a very plastic and aluminous clay; it is divided into small fragments, and then burnt at a very high temperature (at about thirty degrees of Wedgwood's pyrometer); during at least thirty hours after this calcination, and while still of a white heat, it is precipitated into the coldest water possible. This operation is intended to obtain a sudden disruption of the particles, which facilitates the separation of the sediment, after which the pulverizing and sifting are proceeded with, in order to obtain a perfectly regular and uniform quality of cement.

Secondly, the same kind of clay is selected, cleaned, and then diluted in three times its weight of water, and well stirred and strained, in order to free it from sulphureous pyrites and from little calcareous stones which it may contain. After having washed and sifted it, it is allowed to settle. The supernatant liquid is decanted in proportion as the clay precipitates. When the deposit which results is of the consistency of paste or plastic material, the cement obtained from the above-mentioned calcination is mixed with it; the plastic compound obtained from this mixture is suitably triturated, worked up, and puddled, and when suitable for moulding it is fit for use.

The proportions of this composition may be varied, but this variation depends on the plastic nature of the clay which may be considered best for the purpose.

The proportions for one hundred pounds weight of plastic material to be obtained will be about,—

	Forty pounds of clay,	} = One hundred pounds.
	Thirty pounds of the cement,	
30	Thirty pounds of white sand,	

These proportions may be varied, according to the nature of the materials used.

The sides of the retorts are easily formed by moulding them in plaster moulds which have been suitably baked in an oven.

When the parts are moulded they are submitted to dessication and to baking or burning at a temperature of thirty degrees of Wedgwood's pyrometer. In some cases they may be saturated with carbon, in order to give them greater consistency.

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Having described the nature of our Invention, and the manner in which the same is or may be performed, we declare that what we claim as our Invention intended to be secured is,—

First, the arrangement and construction of the above described smoke-consuming furnace, with refractory or fire-proof ceramic materials, as 5 described.

Secondly, the composition of the refractory or fire-proof ceramic substances used in the furnace for forming the plastic material, such as herein-before described.

In witness whereof, we, the said Jean Jacques Bouvert and François 10
Isidore Jean Pascal, have hereunto set our hands and seals, this
Twenty-first day of July, in the year of our Lord One thousand eight
hundred and fifty-seven.

BOUVERT.

(L.S.)

15

PASCAL.

(L.S.)

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F I G. 5.

F I G. 4.

F I G. 6.

F I C. 9.

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